

Claims

What is claimed is:

1. A power splitter comprising:

- 5 a) a substrate having a top layer, a bottom layer and a plurality of inner layers;
- b) a resistor and a plurality of terminals formed on the top layer, and a plurality of conductive pads formed on the bottom layer;
- c) a capacitor formed between one of the inner layers and a ground plane formed on one of the inner layers;
- 10 d) a binocular core transformer attached to the top layer and electrically connected to the terminals, the transformer providing impedance matching and dividing;
- e) a plurality of vias extending between the layers for providing electrical connections between the resistor, the capacitor and the transformer; and
- f) an insulative overglaze located over the resistor and at least partially under the
15 transformer, the insulative overglaze protecting the resistor from contacting the transformer.

2. The power splitter according to claim 1 wherein the substrate is formed from layers of low temperature co-fired ceramic.

3. The power splitter according to claim 1 wherein the transformer has a plurality of windings.

4. The power splitter according to claim 1 wherein the transformer is attached to the substrate using an epoxy.

5. The power splitter according to claim 3, wherein the windings are electrically connected to the terminals by a plurality of welds.

6. The power splitter according to claim 1 wherein the substrate is connected to a printed circuit board by a reflowed solder paste attached to the conductive pads on the bottom layer.

7. The power splitter according to claim 1 wherein the capacitor has one electrode formed on one of the inner layers and another electrode formed on another one of the inner layers.

8. The power splitter according to claim 1 wherein at least two of the power splitters are cascaded.

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9. The power splitter according to claim 1 wherein two power splitters are cascaded to form a 4-way power splitter.

10. The power splitter according to claim 1 wherein four power splitters are cascaded
5 to form a 8-way power splitter.

11. A power splitter for providing impedance matching and dividing, the power splitter having an input port and a first and second output port, the power splitter comprising:
- a) a multi-layered low temperature co-fired ceramic substrate, the substrate having a top surface and a bottom surface;
 - 5 b) a plurality of terminals located on the top surface;
 - c) a binocular core transformer attached to the top surface, the transformer having a first leg, a second leg, a third leg and a first winding wound around the first leg and a second winding wound around the third leg, each of the windings having ends connected to the terminals;
 - 10 d) a plurality of vias extending through the substrate for providing an electrical connection between the terminals and the bottom surface;
 - e) a resistor formed on the top surface and located at least partially under the transformer and electrically connected between the first and second output ports;
 - f) a capacitor formed within the substrate and electrically connected by the vias
 - 15 between the transformer and a ground connection; and
 - g) an insulative overglaze located over the resistor and under the transformer, the insulative overglaze preventing the transformer from contacting the resistor.
12. The power splitter according to claim 11 wherein the transformer is attached to the
- 20 substrate using an epoxy.

13. The power splitter according to claim 11 wherein the windings are electrically connected to the terminals by a plurality of welds.

5 14. The power splitter according to claim 11 wherein the substrate is connected to a printed circuit board by a reflowed solder paste attached to a conductive pad on the bottom surface.

15. The power splitter according to claim 11 wherein the capacitor is formed by a pair
10 of electrodes having a layer of the low temperature co-fired ceramic therebetween, the electrodes each connected to a via.

16. The power splitter according to claim 11 wherein at least two of the power splitters are cascaded into a higher order splitter.

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17. The power splitter according to claim 11 wherein two power splitters are cascaded to form a 4-way power splitter.

18. The power splitter according to claim 11 wherein four power splitters are cascaded
20 to form a 8-way power splitter.

19. A method of manufacturing a power splitter comprising the steps of:
- a) providing a plurality of layers of low temperature co-fired ceramic including a top layer, a bottom layer and a plurality of inner layers;
 - 5 b) punching a plurality of holes in the low temperature co-fired ceramic layers;
 - c) filling the holes with a conductive material to form a plurality of vias;
 - d) screening a resistor and a plurality of terminals onto the top layer and a pair of electrodes onto two of the inner layers, the electrodes and one of the layers forming a capacitor, screening a ground plane onto one of the inner layers and screening
 - 10 an insulative overglaze over the resistor, the electrodes, resistor, terminals and ground plane connected to at least one of the vias;
 - e) stacking the layers;
 - f) firing the stacked layers in an oven to form a unitary substrate; and
 - g) attaching a transformer having a plurality of wire windings to a top of the unitary
 - 15 substrate over the insulative overglaze; and
 - h) welding the wire windings to the terminals such that the wire windings are electrically connected to the resistor, the capacitor and the ground plane.
20. The method according to claim 19 wherein the transformer is attached to the
- 20 substrate using an adhesive.

21. The method according to claim 19 wherein the transformer has a binocular core, the windings wound around the core so as to form an input port and a pair of output ports.

5 22. The method according to claim 19 wherein the substrate is attached to a printed circuit board, further comprising the steps of:

- a) screening a solder paste onto a bottom surface conductive pad;
- b) placing the substrate onto the printed circuit board; and
- c) reflowing the solder paste such that the substrate is attached to the printed circuit

10 board.